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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,992	03/19/2004	Thorsten Heinz	SCHO0174	8937

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EXAMINER
YIP, JACK

ART UNIT	PAPER NUMBER
3715	

NOTIFICATION DATE	DELIVERY MODE
12/28/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/804,992	HEINZ ET AL.	
	Examiner	Art Unit	
	JACK YIP	3715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 August 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21,23 and 24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21,23-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the amendment filed 8/7/2009; claims 1 - 21, 23, 24 are pending; claim 22 is withdrawn.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 4, 21, 23, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holton et a. (US 5,381,512) in view of Ren et al. (US 5,776,179).

Re claims 1, 21:

[Claim 1] Holton discloses a hardware apparatus for analyzing a sound signal (Holton, Abstract), comprising:

an ear model for deriving (Holton, Abstract), for a number of inner hair cells, an estimate for a time-varying concentration of a transmitter substance inside a cleft between an inner hair cell and an associated auditory nerve from the sound signal, so that an estimated inner hair cell cleft contents map over time is obtained (Holton, figs 2A - 2B, fig 9, fig 11, fig 14, fig 16 and associated text); and (Holton, col 24, lines 54 - 68; col 25, lines 1 - 67; col 26, lines 1 - 32)

a pitch analyzer for analyzing the cleft contents map to obtain a pitch line over time, the pitch line indicating a pitch of the sound signal for respective time instants (Holton, fig 2A - 2B and associated text), where the pitch line varies in time over higher frequencies and lower frequencies as determined by the pitch analyzer (Holton, figs 2A - 2B, fig 9, fig 11, fig 14, fig 16 and associated text).

Holton does not explicitly disclose mapping amplitude (or intensity), frequency and time on the same graph. However, Ren discloses a method for evaluating the electromotility of hair cells within the cochlea of a mammalian ear by providing an electrode in proximate relation with the round window and applying electricity therethrough in order to electrically excite hair cells within the cochlea to produce electrically evoked otoacoustic emissions therefrom. Ren further teaches estimating inner hair cell cleft contents map over frequency and over time is obtained (Ren, figs 14 - 16). Ren additionally states (Ren, col 9, lines 64 - 67; col 10, lines 1 - 12) "With each pressure change that occurs within the inner ear, a propagating vibration wave travels along the basilar membrane to produce displacements at **structural locations** along the membrane that resonant when subjected to **the corresponding frequency of vibration**." Ren also states (Ren, col 10, lines 56 - 65), "... The portion of the basilar membrane nearest the middle ear is configured to vibrate in response to high -frequency tones. Furthermore, high -frequency sounds have a tendency to die out quickly. **Therefore, hair cells carried on the basilar membrane nearest the middle ear are typically stimulated in response to high-pitch tones, as compared with hair cells in regions further displaced from the middle ear**.

Therefore, in view of Ren, it would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the method/apparatus described in Holton, by providing the 3D sound spectrum as taught by Ren, since it was known in the art that a 3D graph allows better visualization of the audio spectrum. Furthermore, Ren states (Ren, col 10, lines 56 - 65), "... The portion of the basilar membrane nearest the middle ear is configured to vibrate in response to high -frequency tones. Furthermore, high -frequency sounds have a tendency to die out quickly. Therefore, hair cells carried on the basilar membrane nearest the middle ear are typically stimulated in response to high-pitch tones, as compared with hair cells in regions further displaced from the middle ear. Holton also states (Holton, Abstract) each output waveform corresponds to excitation at different locations along the basilar membrane in the cochlea, and matches the narrow frequency bandwidth, short time response, and wave propagation characteristics of the human cochlea.

[Claim 21] Holton discloses a method of analyzing a sound signal, comprising:

deriving, for a number of inner hair cells, an estimate for a time-varying concentration of a transmitter substance inside a cleft between an inner hair cell and an associated auditory nerve from the sound signal, so that an estimated inner hair cell cleft contents map over frequency and over time is obtained, wherein the inner hair cells comprising lower order inner hair cells indicating lower frequencies and higher order inner hair cells indicating higher frequencies; and

analyzing the cleft contents map to obtain a pitch line over time, a pitch line indicating a pitch of the sound signal for respective time instants, wherein the pitch line varies in time over higher frequencies and lower frequencies as determined by analyzing the cleft contents map,

wherein the method of analyzing is implemented in hardware in the form of a state machine or in software, which is executed by a programmable processor for performing the method of analyzing (Holton, col 7, lines 35 - 63 and see claim 1 above).

Re claim 4

Holton discloses an apparatus, in which the ear model is operative to calculate a transmitter concentration for inner hair cells, wherein each inner hair cell is associated with a specified area of a modeled basilar membrane, and wherein each inner hair cell has associated therewith a different specified area of the modeled basilar membrane (Holton, abstract; “Each output waveform corresponds to excitation at different locations along the basilar membrane in the cochlea …”; col 4, lines 15 - 44).

Holton does not disclose expressly that the ear model is operative to calculate a transmitter concentration for at least 100 inner hair cells. At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to calculate a transmitter concentration for at least 100 inner hair cells because applicant has not disclosed that 100 inner hair cells provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected to calculate a transmitter concentration for adequate number of inner hair cells to accurately represent the modeled basilar membrane.

Re claims 23, 24:

[Claim 23] The hardware apparatus of claim 1, wherein the pitch line over time is used for one or more members of the group comprising: performing a transcription, performing a sound source recognition, performing a music recognition, performing a query by humming process, displaying the pitch line over time(Holton, figs 2A - 2B, 9, 11, 14, 16), extracting auditory streams(Holton, figs 2A - 2B, 9, 11, 14, 16), identifying performing singers, and performing an instrument recognition.

[Claim 24] The method of claim 21, wherein the pitch line over time is used for one or more members of the group comprising: performing a transcription, performing a sound source recognition, performing a music recognition, performing a query by humming process, displaying the pitch line over time(Holton, figs 2A - 2B, 9, 11, 14, 16), extracting auditory streams(Holton, figs 2A - 2B, 9, 11, 14, 16), identifying performing singers, and performing an instrument recognition.

4. Claims 2, 9 - 16, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holton et a. (US 5,381,512) in view of Ren et al. (US 5,776,179) and Herre et al. (US 2004/0068401 A1).

Re claim 2:

Holton does not disclose a hardware apparatus, further comprising a rhythm analyzer for analyzing estimates for selected inner hair cells, the inner hair cells being selected in accordance with the pitch line, so that segmentation instants are obtained, wherein a segmentation instant indicates an end of a preceding note or a start of a succeeding note. However, Herre teaches a device and method for analyzing an audio signal in view of obtaining rhythm information (Herre, Abstract). Herre further teaches (Herre, [0016]) rhythm information of every sub-band is evaluated in means 304a to 304c. For every input signal, first, an envelope-like output signal is calculated (with regard to a so-called inner hair cell processing in the ear) and sub-sampled. From this result, an autocorrelation function (ACF) is calculated, to obtain the periodicity of the signal as a function of the lag. Therefore, in view of Herre, it would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the

apparatus described in Holton, by providing the rhythm analyzer as taught by Herre, since Herre states (Herre, abstract) rhythm information enables a more robust analysis of an audio signal.

Re claim 9:

Holton discloses a hardware apparatus, in which the rhythm analyzer comprises a searcher for searching a dominant estimate for a transmitter concentration in a specified time period and comprising a dominant frequency determined by the pitch line so that, for adjacent time periods, corresponding dominant estimates for different inner hair cells are obtained, wherein the searcher is operative to acknowledge a dominant estimate, when the dominant estimate is above a threshold (Holton, fig 1, 112; col 8, lines 14 - 47; “neutral threshold-crossing stage”).

Re claim 10:

Holton discloses a hardware apparatus, in which the threshold is an amplitude of an estimate comprising the second largest amplitude so that the dominant estimate comprises the largest amplitude in a specified time period (Holton, col 8, lines 58 - 67; col 9, lines 1 - 35; fig 3).

Re claim 11:

Holton discloses an apparatus, in which the rhythm analyzer is operative to build an onset map by calculating an onset value for a dominant estimate for a specified time period, the onset map including a sequence of onset values (Holton, fig 7B, fig 9, fig 11, fig 14, fig 16).

Re claim 12:

Holton discloses a hardware apparatus, in which the rhythm analyzer is operative to calculate an onset value such that an onset value is higher, when an onset comprises a stronger onset rise, compared to another onset comprising a weaker onset rise (Holton, fig 7B, fig 9, fig 11, fig 14, fig 16; col 8, lines 58 - 67; col 9, lines 11 - 35).

Re claim 13:

Holton discloses a hardware apparatus, in which the rhythm analyzer is operative to calculate an onset value such that the onset value is higher, when a starting level before an onset is lower compared to another onset comprising a higher starting level (Holton, fig 7B, fig 9, fig 11, fig 14, fig 16; col 8, lines 58 - 67; col 9, lines 11 - 35).

Re claim 14:

Holton discloses a hardware apparatus, in which the rhythm analyzer is operative to use an estimate (See claim 2) for an inner hair cell representing a fundamental vibration or using an estimate for an inner hair cell representing at least one higher partial vibration.

Re claim 15:

Holton discloses a hardware apparatus, in which the rhythm analyzer is operative to build an onset histogram by combining onset values of estimates for an inner hair cell (Holton, fig 7B, fig 9, fig 11, fig 14, fig 16; col 8, lines 58 - 67; col 9, lines 11 - 35) representing the fundamental vibration, and onset values of an estimate for an inner hair cell (Holton, fig 7B, fig 9, fig 11, fig 14, fig 16; col 8, lines 58 - 67; col 9, lines 11 - 35) representing at least one higher partial vibration, which comprises a time distance smaller than a specified time distance threshold (Holton, col 8, lines 14 - 47).

Re claim 16:

Holton discloses a hardware apparatus, in which the rhythm analyzer is operative to extract maxima from the onset histogram, wherein a time value associated with a maximum indicates a segmentation instant (Holton, col 17, lines 56 - 67; col 18, lines 1 - 26).

Re claim 20:

Holton discloses a hardware apparatus, further comprising a transcription module, the transcription module being operative for using the pitch line segmented at segmentation instants to output a note description (Holton, abstract, "output waveform") or a MIDI description.

5. Claims 5 - 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holton et a. (US 5,381,512) in view of Ren et al. (US 5,776,179) and Herre et al. (US 2004/0094019 A1 denoted hereinafter as Herre'019).

Re claim 5:

Holton discloses a pitch analyze further comprises a vibration period detector (Holton, fig 9; col 16, lines 30 - 50). But Holton does not disclose an apparatus, the vibration period detector being operative for calculating a summary auto correlation function for each time period of a number of adjacent time periods using the estimates for the transmitter concentrations of the number of inner hair cells, and wherein the vibration period detector is further operative, for each inner hair cell, to calculate at least one period between two adjacent maxima in one estimate, and to enter a result into a summary auto correlation function histogram. However, Herre'019 teaches an apparatus for analyzing an audio signal with regard to rhythm information of the audio signal by using an autocorrelation function (Herre'019, Abstract). Herre'019 further teaches (Herre'019, [0015]) rhythm information of every sub-band is evaluated in means 304a to 304c. For every input signal, first, an envelope-like output signal is calculated (with regard to a so-called inner hair cell processing in the ear) and sub-sampled. From this result, an autocorrelation function (ACF) is calculated, to obtain the periodicity of the signal as a function of the lag. Therefore, in view of Herre'019, it would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the apparatus described in Holton, by providing the auto correlation function as taught by Herre'019, since it was known that autocorrelation is a mathematical tool for finding repeating patterns, such as the presence of a periodic signal which has been buried under noise, or identifying the missing fundamental frequency in a signal implied by its harmonic frequencies.

Herre'019 discloses "every input signal, first, an envelope-like output signal is calculated (with regard to a so-called inner hair cell processing in the ear) and sub-sampled. From this result, an autocorrelation function (ACF) is calculated, to obtain the periodicity of the signal as a function of the lag." The Herre'019 does not explicitly explain the particular ACF algorithm being for each inner hair cell, to calculate at least one period between two adjacent maxima in one estimate, and to enter a result into a summary auto correlation function histogram. At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to calculate ACF in the stated algorithm because Applicant has not disclosed that such algorithm provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Herre'019, and applicant's invention, to perform equally well.

Re claim 6;

Holton discloses an apparatus, in which the pitch analyzer is operative to retrieve a maximum value from each histogram of the time sequence of histograms, the maximum value representing a pitch in the time period so that pitch line points are obtained (Holton, col 17, lines 56 - 67; col 18, lines 1 - 26).

Re claim 7:

Holton discloses an apparatus, in which the pitch analyzer is further operative to build pitch line subtrajectories by combining pitch line points being close in time with respect to a time threshold and being close in frequency with respect to a frequency threshold (Holton, col 8, lines 58 - 67; col 9, lines 1 - 59; col 11, lines 63 - 67; col 12, lines 1 - 24).

Re claim 8:

Holton discloses an apparatus, in which the pitch line analyzer is further operative to fuse pitch line subtrajectories with a minimum length and to discard any subtrajectories not fulfilling a criterion related to a minimum length and amplitude (Holton, col 8, lines 58 - 67; col 9, lines 1 - 59; col 11, lines 63 - 67; col 12, lines 1 - 24).

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holton et a. (US 5,381,512) in view of Ren et al. (US 5,776,179) and Gilman (US 5,176,620).

Re claim 3

Holton does not disclose an apparatus in which the ear model comprises: a mechanical ear model and an inner hair cell model. However, Gilman teaches a hearing aid having a liquid transmission means communicative with the cochlea and method (Gilman, abstract). Gilman further teaches a mechanical ear model for modeling an auditory mechanical sound processing up to the inner ear (cochlea) to obtain estimates for representations of mechanical vibrations of the basilar membrane and lymphatic fluids (Gilman, fig 4 and associated text); and an inner hair cell model for transforming the estimates for representations of mechanical vibrations into the estimates for the transmitter concentrations at the inner hair cells (Gilman, fig 4 and associated text). Therefore, in view of Gilman, it would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the apparatus described in Holton, by providing the model as taught by Gilman, since such modification would provide hearing aid to the hearing disabilities.

7. Claims 17, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holton et a. (US 5,381,512) in view of Ren et al. (US 5,776,179) and Hartley (US 5,417,113).

Re claim 17:

Holton does not disclose an apparatus, further comprising a timbre recognition module. However, Blamey teaches a timbre recognition module being operative for: constructing a feature vector; feeding the feature vector into a pattern recognition device; and obtaining a result indicating a probability that at least a portion of the sound signal has been produced by a sound source from a number of different specified sound sources (Hartley, col 6, lines 63 - 67; From col 7). Therefore, in view of Hartley, it would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the apparatus

described in Holton, by providing the timbre recognition as taught by Harley, since such modification would allow the sound sources to be recreated by the system.

Re claim 19:

Holton discloses an apparatus, in which the feature vector comprises one or more selected members from a feature group including onset time of a fundamental vibration or a higher order partial vibration, a frequency of a fundamental vibration or a higher order partial vibration, an amplitude of a fundamental vibration or a higher order partial vibration, a number of an estimate for the transmitter concentration using the highest peak for the fundamental vibration or a higher order partial vibration, or a number of an estimate for the transmitter concentration being in resonance for a fundamental vibration or a higher order partial vibration (Holton, fig 7B, fig 9, fig 11, fig 14, fig 16; col 8, lines 58 - 67; col 9, lines 11 - 35).

8. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holton et a. (US 5,381,512) in view of Ren et al. (US 5,776,179), Hartley (US 5,417,113) and Blamey et al. (US 2003/0171786 A1).

Re claim 18:

Holton does not disclose an apparatus in accordance with claim 17, in which the pattern recognition device is a neural network. However, Blamey teaches a sound processor for a cochlear implant (Blamey, Abstract). Therefore, in view of Blamey, it would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the apparatus described in Holton, by providing the neural network as taught by Blamey, since such modification would allow the system to attach directly to a person for accurate reading.

Response to Arguments

9. Applicant's arguments with respect to claims 1 - 21, 23 - 24 have been considered but are moot in view of the new ground(s) of rejection.

10. Applicant states “pitch analysis" being "one of the principle features of this invention is that linguistically important speech features such as the location of the glottal pulses and formant frequencies can be determined." The examiner respectfully disagrees. According to MPEP 2111 [R-5], during patent examination, the pending claims must be “given their broadest reasonable interpretation consistent with the specification.” The Federal Circuit’s en banc decision in Phillips v. AWH Corp., 415 F.3d 1303, 75 USPQ2d 1321 (Fed. Cir. 2005) expressly recognized that the USPTO employs the “broadest reasonable interpretation” standard. Pitch by definitions (www.answers.com/topic/pitch): “The distinctive quality of a sound, dependent primarily on the frequency of the sound waves produced by its source.” Therefore, both Holton (Holton, figs 2A - 2B, 9, 11, 14, 16) and Ren (Ren, figs 14 - 16) teach a pitch analyzer which analyzes **the frequency of a sound wave**.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JACK YIP whose telephone number is (571)270-5048. The examiner can normally be reached on Monday - Friday 9:30am - 5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xuan Thai can be reached on (571)272-7147. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. Y./
Examiner, Art Unit 3715

/XUAN M. THAI/
Supervisory Patent Examiner, Art Unit 3715